

ALBERTA CORRESPONDENCE SCHOOL

MAILING INSTRUCTIONS FOR CORRESPONDENCE LESSONS

1. BEFORE MAILING YOUR LESSONS, PLEASE SEE THAT:

- (1) All pages are numbered and in order, and no paper clips or staples are used.
- (2) All exercises are completed. If not, explain why.
- (3) Your work has been re-read to ensure accuracy in spelling and lesson details.
- (4) The Lesson Record Form is filled out and the correct lesson label is attached.
- (5) This mailing sheet is placed on the lesson.

2. POSTAGE REGULATIONS

Do **not** enclose letters with lessons.

Send all letters in a separate envelope.

3. POSTAGE RATES

First Class

Take your lesson to the Post Office and have it weighed. Attach sufficient postage and a green first-class sticker to the front of the envelope, and seal the envelope. Correspondence lessons will travel faster if first-class postage is used.

Try to mail each lesson as soon as it has been completed.

When you register for correspondence courses, you are expected to send lessons for correction regularly. Avoid sending more than two or three lessons in one subject at the same time.

Unit 6

Mathematics 30

Statistics

Assignment Booklet



**Distance
Learning**

Alberta
EDUCATION

Mathematics 30
Assignment Booklet
Unit 6
Statistics
Alberta Correspondence School
ISBN No. 0-7741-0097-4

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Your mark on this unit will be determined by how well you answer the questions in this booklet.

Work slowly and carefully. If you are having difficulties, go back and review the appropriate topic.

The three topics that you studied in your unit are covered in this assignment booklet. The total value of these topics is 100 marks. Each topic is divided into several questions. The value of each question is stated in the left margin.

Be sure to proofread each answer carefully.

Do not hand in this booklet until all questions are completed.

Faxing ?

If you are using a facsimile machine to submit your work, be sure to fill in the information at the bottom of every response page.

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Topic 1	40	
Topic 2	20	
Topic 3	40	
	100	

Teacher's Comments

Topic 1: The Normal Distribution

At the back of this Assignment Booklet is a table of **Areas under the Standard Normal Curve**. You may need this to complete some of the following questions.

1. The following numbers are the test scores from a sample of fifty students. Develop a frequency distribution which consists of ten classes and use this distribution to calculate the mean, mode, and median.

58 63 68 77 90 53 43 55 47 60
 57 76 65 70 81 28 49 73 88 67
 36 75 72 87 96 40 46 51 57 61
 42 76 83 66 57 39 48 54 62 86
 52 60 85 72 45 59 43 68 47 51

- a. Determine the range for these test scores.

- b. Calculate the class width, i .

Class width = range ÷ number of classes

$$i = \frac{\text{range}}{10}$$

=

= (to the next whole number)

- c. Calculate the class limits and the class boundaries for each class interval.

First class interval:

lower limit = lowest score

=

upper limit = lower limit + $(i - 1)$

=

=

The first interval is (-).

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Topic 1: The Normal Distribution

In the book of this Assignment Booklet is a list of Areas under the Standard Normal Curve. You may need this to complete some of the following questions.

The following questions are the first part of a series of 10 questions. Complete a frequency distribution which includes the following data and use this distribution to calculate the mean, mode, and standard deviation.

27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

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Class boundaries are halfway between the upper limit of one class and the lower limit of the next class. The class boundaries for the first interval are 27.5 and 34.5. Calculate the class limits and boundaries for the remaining intervals. Enter these values in the frequency distribution table in part h of this problem.

①

- d. The class mark, x , or midpoint for each class interval is the average of the class limits. The class mark for the first class interval is

$$x = \frac{\quad + \quad}{2} = \underline{\hspace{2cm}}$$

Compute the class marks for the remaining intervals and enter these values in the frequency distribution table.

①

- e. Tally the test scores on a separate piece of paper in order to determine the frequency for each class interval. Then, enter these frequencies in the frequency distribution table.

①

- f. Calculate the product $(f \cdot x)$ for each class interval in the frequency distribution table. This column is used in the calculation of the mean. Add the ten values which give the value of $\sum(f \cdot x)$ shown at the bottom of the $(f \cdot x)$ column.

①

- g. Complete the cumulative frequency column which is used in the calculation of the median.

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- h. The values for the first two class intervals have been given in the following frequency distribution table. The reason for giving these values is to provide you with the proper start for completing the table.

Class Interval	Class Limits	Class Boundaries	Midpoint or Class Mark (x)	Frequency (f)	Products ($f \cdot x$)	Cumulative Frequency
1	28 - 34	27.5 - 34.5	31	1	$1 \times 31 = 31$	1
2	35 - 41	34.5 - 41.5	38	3	$3 \times 38 = 114$	4
3						
4						
5						
6						
7						
8						
9						
10						

$\sum f = n =$	$\sum (f \cdot x) =$
----------------	----------------------

①

- i. Determine the mean (\bar{x}) to two decimal places.

$$\bar{x} = \frac{\sum (f \cdot x)}{n} = \underline{\hspace{2cm}}$$

=

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

①

j. Determine the mode.

Examine the frequency column and note that the highest frequency is _____ and this frequency occurs in the interval _____.
 The midpoint of this interval is _____ so the mode is _____.

①

k. Determine the median to two decimal places.

The cumulative frequency of the median is half the total cumulative frequency. The cumulative frequency of the median is $\frac{1}{2}(50) = 25$. A cumulative frequency of 25 is located in the interval 56 - 62. The boundaries of this interval are 55.5 and 62.5.

Interval with Class Limits 56 - 62

	<u>Boundaries</u>	<u>Cumulative Frequency</u>
(lower boundary)	55.5	19
	↓	↓
	y	25
	↓	↓
(upper boundary)	62.5	28

$$\frac{y - 55.5}{62.5 - 55.5} = \frac{25 - 19}{28 - 19}$$

$$\frac{y - 55.5}{7} = \frac{6}{9}$$

$$y = \underline{\hspace{2cm}}$$

The median is _____.

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4

2. To determine the standard deviation (σ) for the data in question 1, three new columns with headings $(x - \bar{x})$, $(x - \bar{x})^2$, and $f \cdot (x - \bar{x})^2$ are required.

Complete these values in the following table, but round your mean value (\bar{x}) from part i to the nearest whole number before determining the values. Round your final answer to one decimal place.

Class Interval	x	f	$(x - \bar{x})$	$(x - \bar{x})^2$	Products $f \cdot (x - \bar{x})^2$
1	31	1			
2	38	3			
3					
4					
5					
6					
7					
8					
9					
10					

$\sum f \cdot (x - \bar{x})^2$ $=$

$$\sigma = \sqrt{\frac{\sum f \cdot (x - \bar{x})^2}{n}}$$

$$= \sqrt{\quad}$$

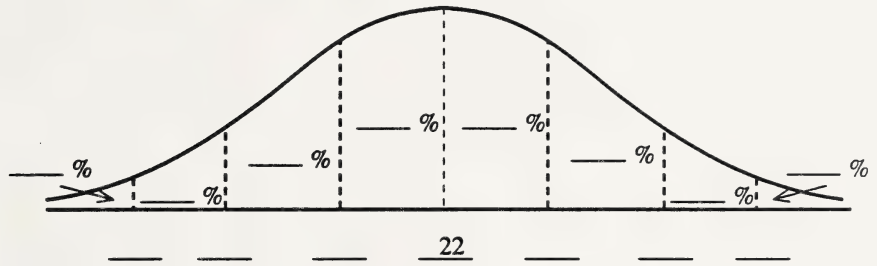
$$= \sqrt{\quad}$$

$$=$$

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

2

3. Temperature readings for a certain day in August over a period of years have a mean reading of 22°C and a standard deviation of 1.5°C . Complete the following normal curve diagram and assume normal distribution. Then, use this diagram to answer the questions that follow.



- What percent of the readings will be between 17.5°C and 20.5°C ?
- What percent of the data is within two standard deviations of the mean?
- What percent of the data is greater than 20.5°C ?

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

②

4. Cookies packaged in boxes have a mean mass of 180 g. The standard deviation is 2 g.
- a. When 8000 boxes are produced, how many boxes are within 2 g of the required mass?
- b. How many boxes will not be accepted if the boxes must have a mass between 176 g and 184 g?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

②

5. A cordless grass shear manufacturer determines the mean life of its shears to be 5.5 years, with a standard deviation of 1.5 years.
- a. If the manufacturer guarantees the shears for one year, what percentage of the shears will have to be replaced?
- b. If 4000 shears are sold to stores, how many shears will have to be replaced within one year?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

①

6. Some test scores are normally distributed with a mean of 90 and a standard deviation of 8. What percentage of the test scores fall between 74 and 98?

②

7. A student obtains a mark of 84 on a math exam. The mean mark for this math exam is 76 and the standard deviation is 12. This same student obtains a mark of 88 on a physics exam. For the physics exam, the mean mark is 79 and the standard deviation is 16. In which course does the student have a better relative standing?

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

①

8. The mean grade for a test was 67 and the standard deviation was 9. If a student had a z-score of 0.78, what was the student's test mark?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

④

9. A battery company determines the mean life of its car batteries to be forty-eight months with a standard deviation of six months.
- a. What is the probability that a battery will last longer than sixty months?
- b. If the company guarantees the battery for forty months, what percentage of batteries will have to be replaced?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

③

10. The speeds of vehicles in a 60 km/h zone are normally distributed about a mean of 63 km/h with a standard deviation of 3 km/h. The police must allow 10% of the posted speed limit in case of error. If 120 cars pass through a radar speed trap in which the posted speed limit is 60 km/h, determine the number of cars stopped for speeding. Assume that all cars travelling 10% or more above the speed limit will be ticketed.

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

②

11. A clothes dryer manufacturer determines the mean life of a dryer to be eighty-six months with a standard deviation of thirty-six months. What guarantee, to the nearest month, should the manufacturer offer if it is only willing to repair 3% of the machines sold?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

②

12. A manufacturer of electric lawn and gardening tools determines that the mean life of its best hedge trimmer is fifteen years, and the standard deviation is four years. What is the probability that a hedge trimmer must be returned within six years?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

④

13. In a survey of 200 male students it is determined that their mean height is 170 cm and the standard deviation is 4 cm. Assume a normal distribution for the heights and answer the following questions.

a. How many students have heights of 167 cm or less?

b. How many students have heights of 177 cm or more?

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

c. How many students have heights between 165 cm and 178 cm?

d. Sixteen percent of the students are below what height?

Topic 1

_____ marks

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

Topic 2: Bivariate Data

①

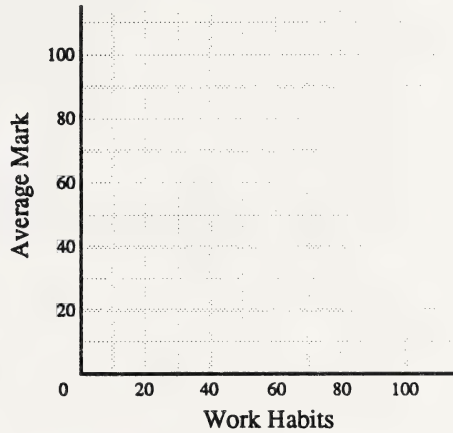
1. Circle the correct response.
The science of collecting and classifying data in order to show their significance is called
- data processing
 - statistics
 - technology
 - mathematics
2. The following table of marks shows the relationship between the work habits and the average marks for students at a college.

Students	Rating of Work Habits	Average Mark
Marie	30	10
Sue	10	30
Joe	30	40
Gary	10	50
Gurmeet	50	30
Sandy	60	60
Lou	60	70
Jerry	40	80
Maria	80	80
Rhonda	80	50
Olga	100	70
Joyce	100	90
Chen	90	90
Roy	20	10

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

2

- a. Draw a scatterplot of the work habits of the students against their average marks.
Place the work habits along the horizontal axis.



1

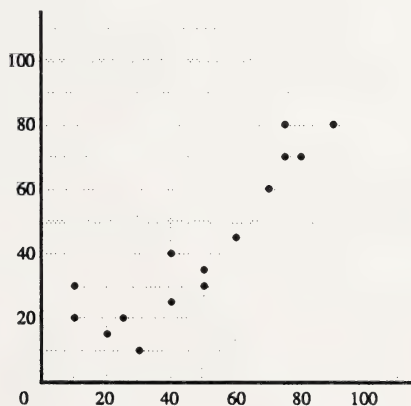
- b. Is there a positive correlation, negative correlation, or no correlation?

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

② c. Discuss the performances of Sandy, Maria, and Chen.

② d. How do the results of Gary and Jerry vary?

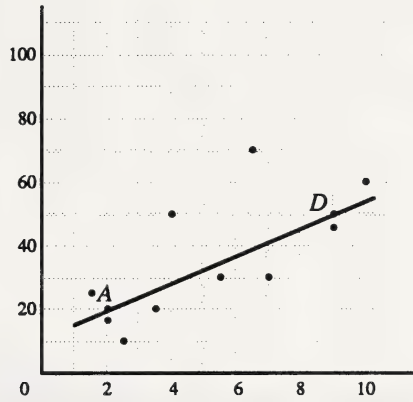
③ 3. Find the line of best fit for the following scatterplot using the median fit method.



Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

3

4. Determine the equation for the line of best fit AD on the following scatterplot.



Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

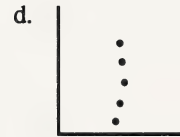
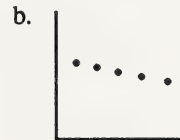
①

5. Circle the correct response.
Which of the following is the range of the correlation coefficient?

- a. $-1 \leq r \leq 1$
- b. $0 \leq r \leq 1$
- c. $-1 < r \leq 1$
- d. $-1 \leq r \leq 0$

①

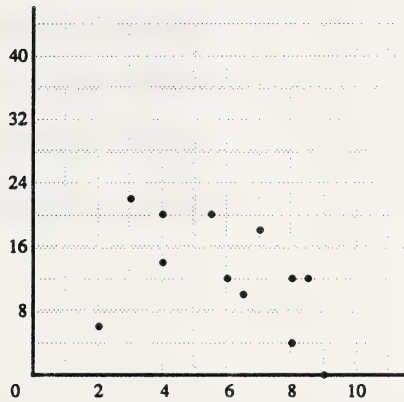
6. Circle the correct response.
Which of the following graphs is an example of a strong negative correlation?



Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

2

7. Draw the line of best fit for the following scatterplot.



1

8. Circle the correct response.

Which of the following is the weakest correlation coefficient?

a. + 0.6

b. - 0.55

c. + 0.12

d. + 0.04

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

①

9. Circle the correct response.
Which of the following indicates how well the line of best fit demonstrates the situation?
- a. standard deviation
 - b. correlation coefficient
 - c. confidence coefficient
 - d. sample of the population

Topic 2

_____ marks

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

Topic 3: Confidence

Circle the correct response for questions 1 to 3.

- ①
1. The proportion of the number of yeses in a population is called the
- a. population percentage
 - b. sample proportion
 - c. confidence interval
 - d. sampling distribution
- ①
2. Which type of sampling is not a type of convenience sampling?
- a. self-selected
 - b. judgement
 - c. clustered
 - d. biased

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

①

3. A sample in which an expert selects the sample based on knowledge of the population is called
- a. systematic sampling
 - b. self-selected sampling
 - c. clustered sampling
 - d. judgement sampling

⑫

4. Explain any four of the following.
- a. correlation

Name of Student _____ Student I.D. # _____
Name of School _____ Date _____

b. bivariate

c. line of best fit

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

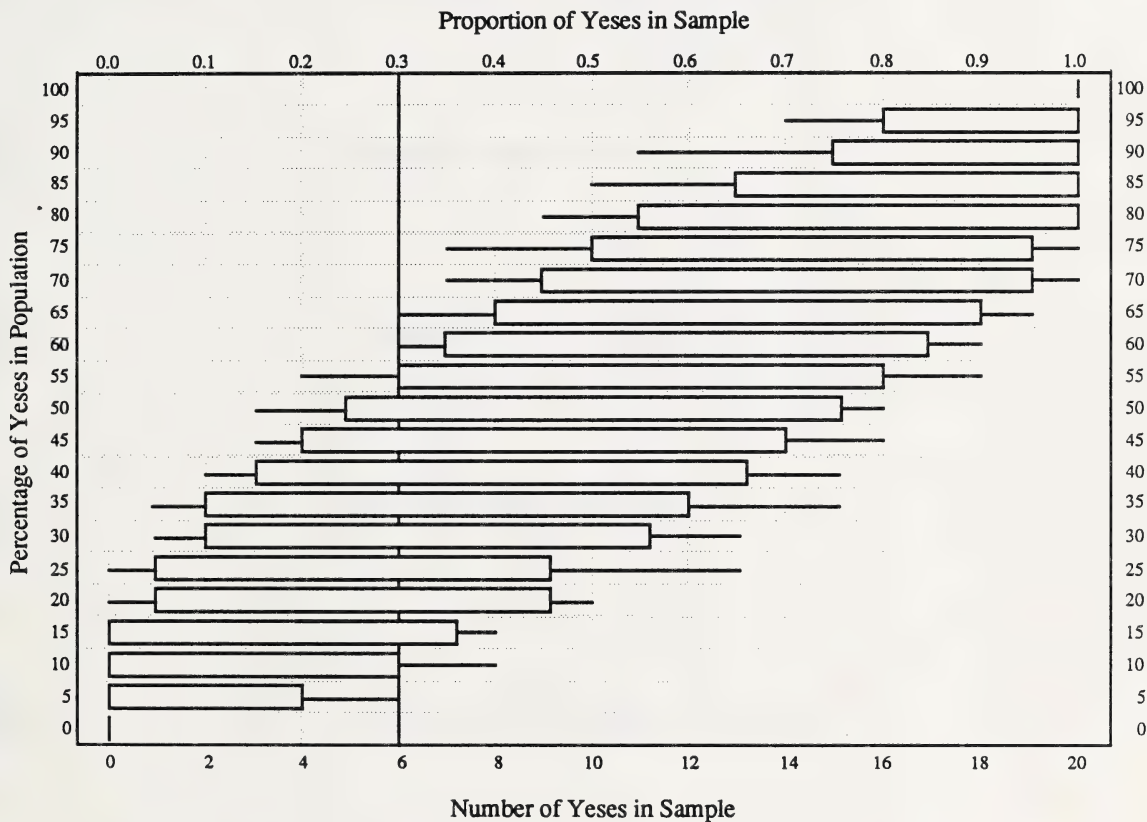
d. measures of central tendency

e. 95% box and whisker plots

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

5. A survey of parents was conducted to find out if they thought they were failures at parenting. The box and whisker plot charts that follow show the results of the survey. Study this chart and answer the questions that follow.

90% Box and Whisker Plots from Samples of Size 20



Name of Student _____ Student I.D. # _____
 Name of School _____ Date _____

②

a. How many parents answered yes?

②

b. How many parents were polled?

②

c. What is the sample proportion?

②

d. What percentage of box and whisker plots was used?

②

e. What is the confidence interval?

②

f. What are the lower and upper confidence limits?

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

5

6. Construct a sampling distribution using the following data.

Sample Number	Responses	Number of Yeses
1	NNYNNNYNNNYNNNNNNNN	4
2	YNNYNNNYNNNNNNYNNNY	6
3	YYYNNNNNYNNNNYNNYNY	8
4	NNNYNNNNYNNNNNNNYNN	4
5	YYYNNNNNYNNNNNNYYY	8
6	NNNNNNYNNNYNNNNNYN	5
7	YYYNNNYNNYNNYNNNNYNN	10
8	NNNYNNYNNNYNNNNNNYNN	6
9	NYNNNYNNNYNNYNNNNYNN	7
10	NNYNNNNYNNNYNNNNYNNY	7
11	NYNNNNNYNNNNNNYNNNYN	5
12	YYYNNNNNNNNNNNYYYYNN	8
13	NNNYYYYNNYNNYNNNNNY	9
14	YNNNYNNNYNNNYNNNNY	7
15	NNNNNYNNYYYNNYNNYNN	9
16	NNNYNNNYNNNYNNNNYNN	6
17	NNYNNNNYNNNNYNNNNYY	6
18	NNNNNNYNNNYYYYNNNY	7
19	NNNNNYNNNNYYYNNYNNY	7
20	YYYNNNNNYNNNNYNNNN	5

Name of Student _____	Student I.D. # _____
Name of School _____	Date _____

Number of Yeses	Sample Proportion	Frequency	Proportion of All Trials
Total		20	1.00

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

4

7. Use the following sample distribution to make a 90% box and whisker plot.

Number of Yeses	Sample Proportion	Frequency	Proportion of All Trials
0	0.00	0	0
1	0.05	0	0
2	0.10	0	0
3	0.15	0	0
4	0.20	0	0
5	0.25	0	0
6	0.30	0	0
7	0.35	1	0.05
8	0.40	1	0.05
9	0.45	4	0.2
10	0.50	5	0.25
11	0.55	3	0.15
12	0.60	3	0.15
13	0.65	2	0.1
14	0.70	1	0.05
15	0.75	0	0
16	0.80	0	0
17	0.85	0	0
18	0.90	0	0
19	0.95	0	0
20	1.00	0	0
Total		20	1.00

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

8. Fill in the following blanks.

①

a. A _____ is selected when each member of the population has an equal chance of being selected and the members of the sample are chosen independently.

①

b. A sample is said to be _____ if a selection method tends to overrepresent or underrepresent some part of the population.

①

c. Judgement and self-selected samples are both types of _____ sampling.

①

d. A _____ sample occurs when the population is divided into different strata, and then a random sample is taken from each strata.

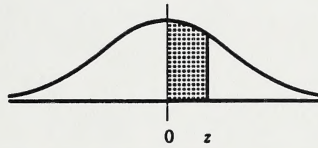
Topic 3

_____ marks

Name of Student _____ Student I.D. # _____

Name of School _____ Date _____

**Areas
under the
Standard
Normal Curve**



z	0	1	2	3	4	5	6	7	8	9
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0754
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

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